

An Evaluation of the Prevalence of Hypokalemia and Hypomagnesemia in the VGH and BC Wide Peritoneal Dialysis Population and Frequency and Cost of Prescription of Potassium and Magnesium Supplements

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Background

- Potassium and magnesium are minerals essential in the functioning of the human body, and low levels of either may adversely affect normal neuromuscular, cardiovascular, and metabolic processes.¹
- Peritoneal dialysis (PD) patients are at increased risk for hypokalemia and hypomagnesemia due to continuous loss of these minerals via dialysate dwells.²
- Studies have shown low potassium and magnesium levels in PD patients to be independent risk factors for mortality.^{3,4}
- There is no current funding for potassium or magnesium supplements through the BC Provincial Renal Agency (BC PRA).
- Expanding BC PRA formulary coverage to include potassium and magnesium supplements may increase accessibility and affordability, and improve PD patient outcomes.

Objectives

- To determine the one-year prevalence rate of hypokalemia and hypomagnesemia in the Vancouver General Hospital (VGH) and BC wide PD patient population.
- To assess the one-year frequency and cost of prescription of potassium and magnesium supplements in the VGH and BC wide PD patient population.

Methods

- Design:** Multi-center, retrospective review utilizing the Patient Records and Outcome Management Information System (PROMIS) database
 - For BC wide data, report provided by PROMIS statisticians
- Study Period:** May 1, 2017 to April 30, 2018 (one year)
- Inclusion:** All BC patients on PD at any point within this timeframe
 - VGH cohort only included PD patients who were still on this dialysis modality on May 1, 2018 when the PD patient list was generated
- Outcomes:**
 - Prevalence of hypokalemia, defined as K < 3.5 mmol/L
 - Prevalence of hypomagnesemia, defined as Mg < 0.7 mmol/L
 - Prescription frequency of potassium and magnesium supplements
 - Yearly cost estimates of potassium and magnesium supplementation based on unit costs and dispensing fees provided by MacDonald's Renal Pharmacy and Laurel Prescriptions
 - Potassium supplement unit costs:** Micro K 8 mEq \$0.1079/tab, Slow K (generic) 8 mEq \$0.0432/tab, K-Dur (generic) 20 mEq \$0.21/tab, KCl liquid 20 mEq/15 mL \$0.01512/mL, K-Lyte 25 mEq \$0.645/tab
 - Magnesium supplement unit costs:** Mg complex 100 mg \$0.1099/tab, Mg glucoheptonate liquid \$0.0215/mL, Mg sulfate 5 g \$7.68/vial
 - Dispensing fees: Macdonald's \$11 and Laurel \$10.80
 - The following algorithm was used to determine the number of dispensing fees to add on to the supplement cost: ≤ 3 months = 1 fee, > 3 to ≤ 6 months = 2 fees, > 6 to ≤ 9 months = 3 fees, > 9 to ≤ 12 months = 4 fees
- Statistical Analysis:** Descriptive through Microsoft Excel

Results

Figure 1: Prevalence of Hypokalemia and Potassium Supplementation

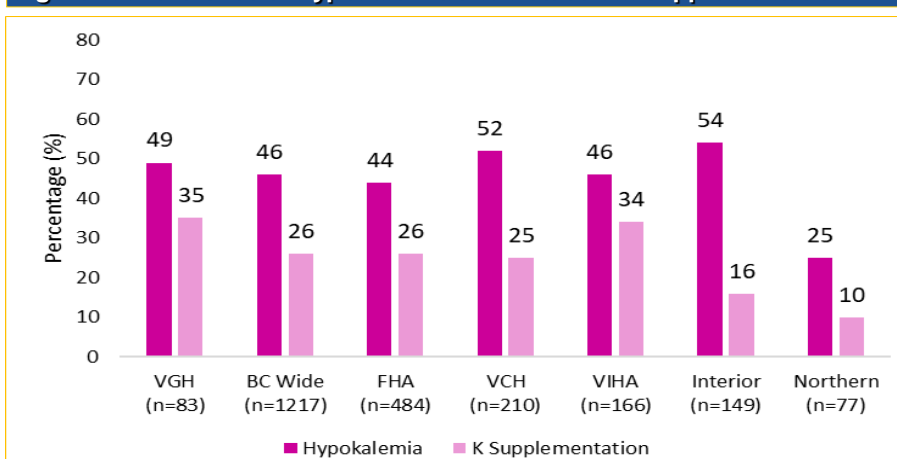
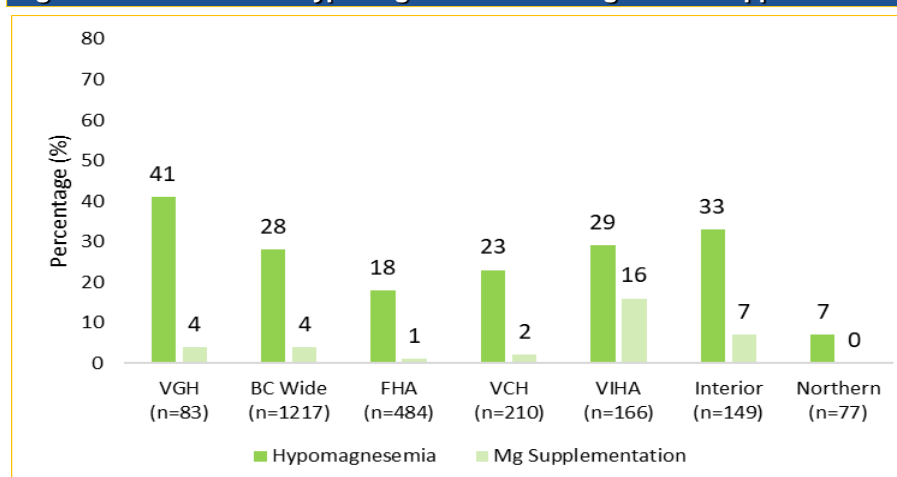


Figure 2: Prevalence of Hypomagnesemia and Magnesium Supplementation



Figures 3 and 4: Classification of Potassium and Magnesium Supplements Utilized Within the VGH PD Cohort

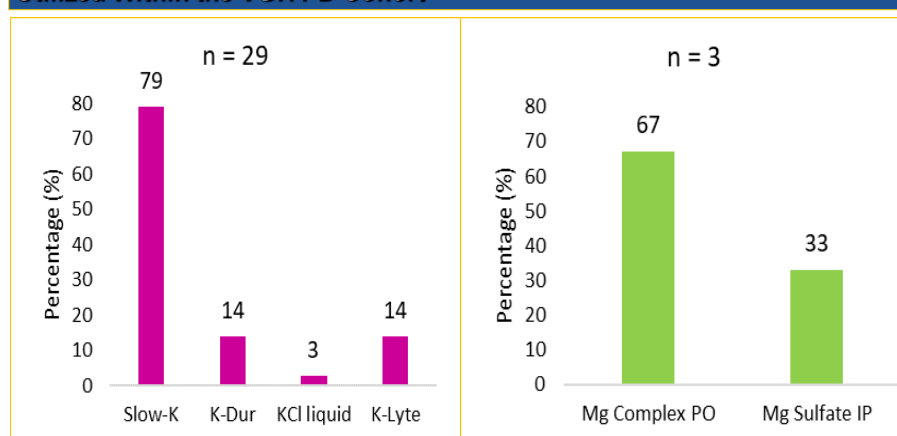
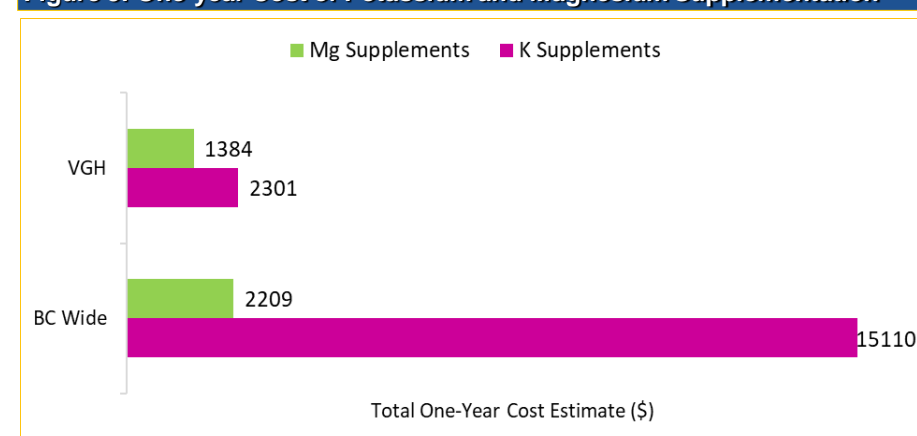


Figure 5: One-year Cost of Potassium and Magnesium Supplementation



Discussion

- For all PD patients in BC (n=1217), 97.5% of patients had serum potassium levels checked at least every 3 months; however, the frequency of serum magnesium level monitoring was much lower at 58.3% of patients.
- Prevalence of hypokalemia and hypomagnesemia were higher than the actual prescription of potassium and magnesium supplements, respectively.
- Cost may present as a barrier, even in patients with private health insurance.
- Compared to other nutritional supplements and hyperkalemia exchange resins listed on the BC PRA formulary, potassium and magnesium supplements have similar or lower costs, e.g. cost of a 100-day supply of KCl 8 mEq/day is \$4.32 and Mg complex 100 mg/day is \$10.99 versus Renavite 1 tab/day is \$6.15, zinc gluconate 70 mg/day is \$5.79, and Kayexalate 15 g/day is \$294.87.

Limitations

- Prevalence of hypokalemia and hypomagnesemia may be underreported as some sites do not monitor potassium and magnesium levels at all or monitor less frequently than every 3 months (cutoff for study inclusion).
- Patients were excluded from supplement cost analysis if exact dose could not be determined (n=25) or if they were on as needed dosing regimens (n=20).
- For BC wide data, we relied solely on the PROMIS database and were unable to verify information with individual patient charts as was done with VGH data.

Conclusion

- We would propose that potassium and magnesium supplements be added to the BC Provincial Renal Agency dialysis formulary.

References

- Redd AS. Fluid, electrolyte and acid-base disorders: Clinical evaluation and management. 2nd ed. Newark: Springer;2018.
- Amirrokni P, Morgan P, Bastani B. Intra-peritoneal administration of potassium and magnesium: a practical method to supplement these electrolytes in peritoneal dialysis patients. Ren Fail. 2007;29:603-6.
- Lee S, Kang E, Yoo KD, et al. Lower serum potassium associated with increased mortality in dialysis patients: A nationwide prospective observational cohort study in Korea. PLoS One [Internet]. 2017 [cited June 8, 2018]. Available from: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0171842>
- Cai K, Luo Q, Dai Z, et al. Hypomagnesemia is associated with increased mortality among peritoneal dialysis patients. PLoS One [Internet]. 2016 [cited June 8, 2018]. Available from: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0152488>